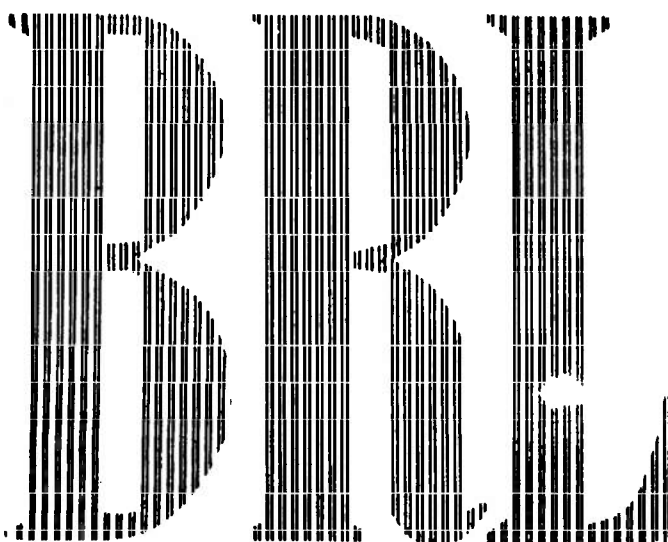


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AUGUST 1961

FREE RADICALS
BIBLIOGRAPHY AND SURVEY OF PUBLICATIONS
(up to 1959)

GEORGE I. LAVIN
ARTHUR D. COATES
JOHN A. RAKACZKY

Department of the Army Project No. 599-04-002
Ordnance Management Structure Code No. 5610.11.703
BALLISTIC RESEARCH LABORATORIES



ABERDEEN PROVING GROUND, MARYLAND

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Terminal Ballistics Laboratory

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GLavin/ACoates/JRakaczky/bjk
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August 1961

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ABSTRACT

A survey has been made of the free radical literature published up to and including the year 1959. Approximately 2200 references are presented in the form of the title of the paper, author, and a brief description of the work where the title is not self-explanatory.

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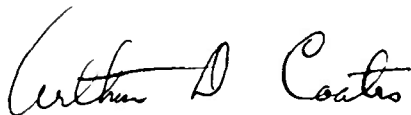
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INTRODUCTION

In the course of the evolution of chemical philosophy the term radical has been used in varying senses, and survivals of earlier significance persist in present day usage. The original concept long antedated clear-cut ideas on molecular structure and the nature of valence forces. It is, perhaps, a fair approximation to state that the word radical originally signified an atomic aggregate or molecular fragment capable of surviving as an entity throughout a series of chemical transformations.

Free radicals, as usually defined in terms of modern valency concepts, are individual atoms or groups of atoms of electronic configuration such that it includes at least one unpaired electron. Such a definition is broad enough to include atoms (other than those of the noble gases), polyatomic molecular fragments such as the long-lived triaryl methyl radicals described by Gomberg, as well as the short-lived alkyl radicals of the Paneth type.

Free radicals thus are fragments of matter which for the most part have only a fleeting existence. They are present in an ordinary flame, in an electric arc, in the atmosphere in the stars and even in the cold interstellar dust. These highly reactive fragments can initiate and sustain a chain reaction among comparatively inactive substances. A relatively small number of free radicals (as few as one per thousand) can maintain a chain reaction. If we understood their behavior fully we would have a master key to the chemistry of the universe.

This survey covers the period up to and including 1959. The bibliography contains approximately 2200 items each of which consists of the author, subject, journal reference and a short abstract if the title of the paper is not self-explanatory. The references are listed alphabetically by the last name of the senior author. An author index also is included. This bibliography was compiled during the course of free radical investigations being conducted at these Laboratories. It is our wish that it will be as useful to others as it has been to us. It is also hoped that it will act as a catalyst in furthering future free radical research.

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(3) $\text{HO}_2 + \text{H}_2\text{O}_2 = \text{H}_2\text{O}_2 + \text{O}_2$
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meter tube. The ionization
potentials were found to be:
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(2) $Na + Na + H = NaH + Na^*$
with collision yield
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(3) $Na + H + H = H_2 + Na^*$ with
collision yield 1×10^{-5} .
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The reactions
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 $\text{Me} + \text{AcMe} = \text{CH}_4 + \text{CH}_2\text{COMe}$
 $\text{Me} + \text{CH}_2\text{COMe} = \text{EtCOMe}$
Accounted for approx. 95% of the methyl radicals disappearing during the photolysis. No evidence for the reaction
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 $OH + OH + M = H_2O_2 + M$
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